

SECTION 03742
CONCRETE CRACK SEALING WITH INJECTED
CHEMICAL GROUT

DESCRIPTION

1.1 DESCRIPTION OF WORK

- A.** This Section specifies requirements for sealing leaking concrete joints, cracks, fractures and holes with injected chemical grouts.
- B.** This section applies to remedial repair of new construction and repair of existing construction under this contract in cases where slurry walls, concrete, or water proofing applications do not meet the specified watertightness.
- C. Related work:** Following items are not included in this specification section and will be performed under designated specification sections.
 - 1. Section 03740 Structural Crack Repair by Epoxy Injection
 - 2. Section 03930 Concrete Rehabilitation
 - 3. Section 07131 Self-Adhering Sheet Waterproofing
 - 4. Section 07141 Cold Fluid-Applied Waterproofing
 - 5. Section 07142 Hot Fluid-Applied Waterproofing
 - 6. Section 07170 Bentonite Waterproofing

0.2 PERFORMANCE REQUIREMENTS

- A.** Provide and install products which prevent the passage of water.

0.3 SUBMITTALS

- A.** Submit manufacturer products data. Submit installation instructions, use limitations and recommendations for proper use of the grout materials, and provide the manufacturers current printed literature on specified products.
- B.** Submit a list of equipment and a detailed procedure for the installation.
- C.** Submit names and qualification of installer and manufacturer's field representative.
- D.** Furnish documentation of quantities and batch numbers of materials used at each location.

0.4 QUALITY ASSURANCE

- A.** The manufacturer of the specified products shall have an established program of training certifying, and technically supporting general contractors
- B.** The installer shall be accepted by the manufacturer of the specified product, shall have completed a program of instruction in the use of the specified repair material, shall provide certification from the manufacturer attesting to being an approved installer, and shall be able to demonstrate past performance on jobs of similar scope which have performed satisfactorily for a minimum of 3 years.

1.5 MANUFACTURER AND FIELD REPRESENTATIVE

- A.** The Contractor shall arrange with the materials manufacturer to have the services of competent field representatives at the work site prior to start of grouting work to assure proper application procedures. The representative shall remain at the job site after work commences and continue to instruct until the representative, the contractor, and the Engineer are satisfied that the crew is installing the system successfully. The representative shall make periodic visits to the project as the work progresses and shall confer on each visit with the Contractor and Engineer.
- B.** The manufacturer field representative shall verify the Contractors quality control procedures and documentation.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A.** Deliver the specified products in original, unopened containers with the manufacturer's name, labels product identification, and batch numbers.
- B.** Store the specified products in condition as recommended by the manufacturer. Protect against freezing. Discard any frozen material.

PART 2 PRODUCTS

2.1 POLYURETHANE CHEMICAL GROUT

- A. The grouting material shall be a one or two component low viscosity hydrophilic or hydrophobic polyurethane liquid of the type that is injected into joints, holes or cracks. Material must also be suitable when used in conjunction with a carrier medium such as oil-free oakum or open cell backer rod to stop highly active leaks. Compound shall be non-toxic and non- flammable after curing. The polyurethane liquid shall react only with water to foam and expand to form a flexible, tough, polyurethane gasket that stops water. Material must resist seawater, common acids and petroleum and be designed for use in sealing leaks in concrete structures.

- B. Properties of Uncured Polyurethane Chemical Grout:

Property	Standards	
Results		
1.Solids Content:	ASTM 2369	100 %
min		
2.Viscosity:	ASTM 2196 at 77°F	700
CPS max		
3. Elongation (cured)	ASTM D3574	125 %
min.		
4. Flash Point (Pensky Martens)	ASTM D93	
215 °F min		

2.2 ACRYLIC GROUT

- A. The grouting material shall be multiple component, low viscosity, acrylic liquid grout which forms a flexible, waterproof gel when cured. The gel time shall be adjustable to meet the site conditions without negatively impacting the properties of the cured grout. All components required to catalyze and cure the chemical grout shall be supplied by the grout manufacturer. Material must resist seawater, common acids and petroleum and be designed for use in sealing leaks in concrete structures.

- B. Properties of Acrylic Chemical Grout:

Property	Standards	Results
1.Viscosity:	ASTM D2196 at 77F	20 CPS max
2.Elongation (at break)	ASTM D638	250% min
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3.Flash Point (Pensky Martens)
min

ASTM D93

215 °F

2.3 ELASTOMERIC POLYMER RUBBER GROUT

- A.** One component elastomeric polymer rubber liquid designed to be injected through concrete to the waterproofing membrane behind joints, holes and cracks to stop active leaks. Compound shall be non-toxic and non-flammable after curing. The rubber liquid shall stay in a plastic condition. Material must resist seawater, common acids and petroleum and be designed for use in sealing leaks in concrete structures.

B. Properties of Elastomeric Polymer Rubber Grout:

Property	Standards	Results
1.Solids Content:	ASTM D1353	75% min
2.Viscosity: CPS min	ASTM D2196 at 70F	3,000,000
3.Softening	ASTM D36	90°F max
4. Flash Point (Pensky Martens) degrees F min	ASTM D56	200

2.4 ACCESSORIES

- A.** Packers for automated application shall be supplied from the manufacturer of the grout or equivalent in type, size and material. Equivalent packer must be acceptable to grout manufacturer and Engineer.
- B.** Moisture impermeable hoses are required for use where grout material is being pumped.
- C.** Other materials, as required by the grout manufacturer as needed.

2.5 PUMPS AND MISCELLANEOUS EQUIPMENT

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- A. Use only pumps and mixers approved by grout manufacturer.
- B. Hammer drills and masonry bits or core drills as required installing packers for grouting in accordance with manufacturer's recommendations.

PART 3 EXCUTION

3.1 PREPARATION

General

- A. The concrete cracks, holes, joints, and fractures shall be clean and sound. Remove dust, laitance, grease, curing compounds, waxes impregnations, foreign particles, coatings, efflorescence, rust, stains, and deleterious materials by wire brushing, scraping or by mechanical methods.
- B. If the crack or joint to be injected is ½ inch wide or greater at surface, use oil free oakum saturated with grout and mix with water. Hold oakum for 1 to 2 minutes to allow foaming and insert oakum into the crack, hole or joint. Water shall be sprayed into area before inserting activated oakum.
- C. Acrylic or Polyurethane
 - a. Drill offset injection holes at a distance from the crack or joint half the depth of the concrete
 - b. Drill at a 45 degree angle to intersect the crack or joint at just over half the depth of the concrete.
 - c. Alternate the injection holes on either side of the crack or joint.
 - d. Space holes so the grout can completely fill the crack or joint.. Injection hole spacing is normally 6 inches to 24 inches apart depending upon the width of the defect. Generally the wider the defect, the greater the distance of grout travel; therefore the injection holes will be farther apart. Use test holes to pump water into the cracks or joint to determine spacing for injection holes.

- e. Install the injection packers in holes and tighten.
- f. All locations to be grouted shall be thoroughly flushed with clean water pumped through the packers to remove dirt, dust, and other contaminants.

D. Elastomeric Polymer Rubber Grout

- a. Clean and surface seal crack or joint to prevent material from leaking.
- b. Determine thickness of concrete and drill or core perpendicular to the surface, through the concrete to the waterproofing membrane. Size and spacing to be in accordance with grout manufacturer's written recommendations. Clean holes as required to install grout pipe/packers.

3.2 APPLICATION

A. General

- 1. Follow manufacturer's guidelines for temperature restrictions during installation of grout products.
- 2. The injection equipment shall meter the chemical grout and dispense the product into the prepared crack, hole, joint or area of defective waterproofing. The unit shall be portable and be approved by grout manufacturer. The pump shall provide control of the chemical grout at the nozzle. The pumps shall be air powered or electric, shall provide an in-line pressure metering system, and shall contain drain-back plugs, if required.
- 3. Follow manufacturer's recommendations for the use of safety equipment required.

B. Installation Procedure – Polyurethane and Acrylate Grouts

- 1. Follow steps listed in preparation section above.
- 2. The entire crack must be flushed prior to the injection of polyurethane or acrylate grout. Pump grout through the approved injection ports. Observe

the return of the water from the surface of the crack prior to moving the next injection port.

3. If concrete being injected contains insufficient moisture to activate the grout, inject defect with water prior to injecting the polyurethane chemical grout. Pump chemical grout or as required to fully penetrate the crack or joint.
4. Pump chemical grout for 45 seconds and then pause to allow the material to flow into all the cracks and crevices. Visually inspect for material flow and water movement to appear on the surface. When grout reaches next packer and water movement stops, begin injection into the next packer. When sealing vertical cracks, begin injecting at the bottom of the crack and work vertically. If faster reaction time is needed, or if grout is being pumped at the cold temperature and accelerator may be added to base material. Consult manufacturer before adding an accelerator. Re-inject to assure that all voids are properly sealed off.
5. If crack or joint is dry at the time of injection with polyurethane grout, follow grout injection with an injection of water to activate grout.

C. Installation Procedure - Elastomeric Polymer Rubber Grout

1. Follow preparation as listed above.
2. Using low pressure, slowly inject grout until counter flow is observed at adjacent injection hole.
3. Move to next injection location, and patch previous hole as required.
4. Continue until all locations have been injected.

- D.** Inspect repaired areas after grout has cured. If leaking continues, repeat above steps as required to stop the leak.
- E.** Remove packer and restore injection locations to match surrounding surface in areas which can be viewed by the public. For all other areas there is no need to remove the packers. However excess grout and debris must be removed.
- F.** Adhere to all manufacturer's notes appearing in product literature, and the following precautions:
1. Drawings of the areas to be repaired shall be reviewed before start.
 2. Minimum substrate temperature shall be 40 degrees F unless otherwise stated in manufacturer's literature.
 3. All equipment in contact with grout shall be dry. (Separate pumps required for grout and water).

3.3 CLEANING

- A.** Provide suitable canvas or plastic traps to protect adjacent areas during injection.
- B.** Clean overflow from adjacent surfaces using materials and methods recommended by manufacturer. Leave finished work and work in area neat, clean condition without evidence of spillovers.

COMPENSATION

4.1 MEASUREMENT

- A.** Leak repair will be measured by the linear feet of leaks repaired. One unit of payment will be cracks repaired zero to ten (10) feet off finished floor. A second unit of payment will be greater than ten (10) feet off finished floor.

4.2 PAYMENT

- A.** Payment for concrete crack repair will be made at the Contract unit price for the quantities specified herein.

4.3 PAYMENT ITEMS

ITEM NO.	DESCRIPTION	UNIT
03742.001	CRACK REPAIR (0-10 FEET)	LF
03742.002	CRACK REPAIR (> 10 FEET)	LF

NOTES TO THE DESIGNER

- A.** Any request to modify or waive the specification requirements listed below must be approved in writing by the MBTA Project Manager:
 - 1. No substitution of new grout materials

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